5.16 PUBLIC HEALTH

This section presents the methodology and results of an assessment of potential public health impacts associated with construction and routine operation of the PEF Expansion project. The existing PEF includes three natural gas-fired combustion turbine generators (CTGs), each with a heat recovery steam generator (HRSG); two steam turbines; a 16-cell cooling tower; a 436 hp diesel-fired emergency IC engine powering a water pump; a 1,529 hp natural gas-fired emergency IC engine powering a 1,100 kW generator; and ancillary facilities. The plant output will be increased from the current nominal rating of 750 MW to a total of 910 MW by the addition of the fourth CTG. Both the incremental impacts to public health associated with the PEF Expansion and the cumulative health impacts associated with the existing PEF and the PEF Expansion combined have been evaluated.

Air is the dominant pathway for public exposure to chemical substances that will be released by the project into the environment. Accordingly, the primary focus of this assessment is on characterizing the potential risk to human health associated with routine (non-emergency) emissions of "air toxic" compounds from the stacks of the new turbine and the other fuel burning sources of the existing PEF. Air toxics are compounds for which ambient air quality standards have not been established, but which are known or suspected to cause short-term (acute) and/or long-term (chronic) carcinogenic or non-carcinogenic health effects. A screening level health risk assessment to evaluate risks associated with project air toxics emissions has been prepared using CARB's Hotspots Analysis and Reporting Program (HARP) computer program and associated guidance in the OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (August 2003).

Impacts associated with the project's emissions of "Criteria Pollutants" (compounds with ambient air quality standards) are addressed in detail in Section 5.2 and summarized in Section 5.16.2.3. Potential exposures to hazardous substance releases due to upset conditions are addressed in Section 5.15.

Also of potential concern with respect to public health are exposures to electric and magnetic fields (EMF) in the vicinity of project transmission lines. The transmission facilities and their routes are described in Section 3.6, along with a discussion of the associated electric and magnetic field strengths. A discussion of transmission line safety and nuisance is presented in Section 4.2. Potential public health impacts from electromagnetic exposure are discussed in Section 5.16.3.

5.16.1 Affected Environment

The existing PEF turbine stacks will exhaust combustion gases at a height of 150 feet (45.7 meters) above the local grade elevation of 1,069 feet (326 meters). The new combustion turbine for the PEF Expansion will have a stack height of 131 feet (39.9 meters). Topographical features within a ten-mile radius, which are of equal or greater elevation than the assumed stack exhaust exit point for the new turbine (stack height plus grade elevation; 1,200 feet or 366 meters), are shown on Map 5.16-1 of this application (this map is the same map that was used for 99-AFC-7).

Sensitive receptors are defined as groups of individuals that may have a heightened susceptibility to health risks from chemical exposures. Schools, day care facilities, convalescent homes, and hospitals are typically of particular concern. No sensitive receptors were identified within ten miles of the project site. Map 5.16-2 of this application (this map is the same map that was used for 99-AFC-7) shows the population census tracts and population density within a ten-mile radius of the existing PEF plant site.

5.16.2 Environmental Consequences

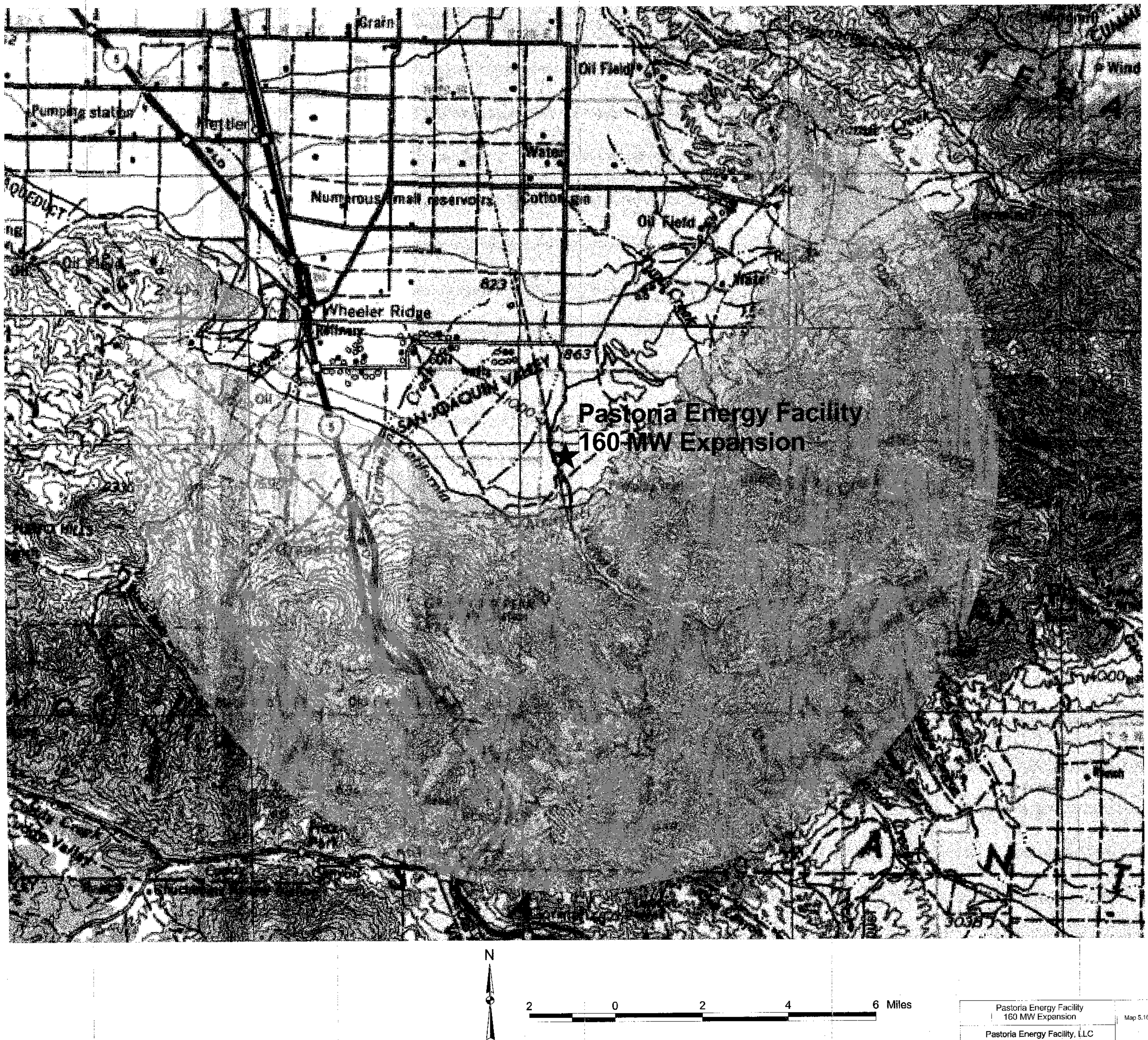
The potential environmental consequences related to pubic health risks from the existing PEF and the PEF Expansion projects are described in this section.

5.16.2.1 Public Health Risks – Construction Phase

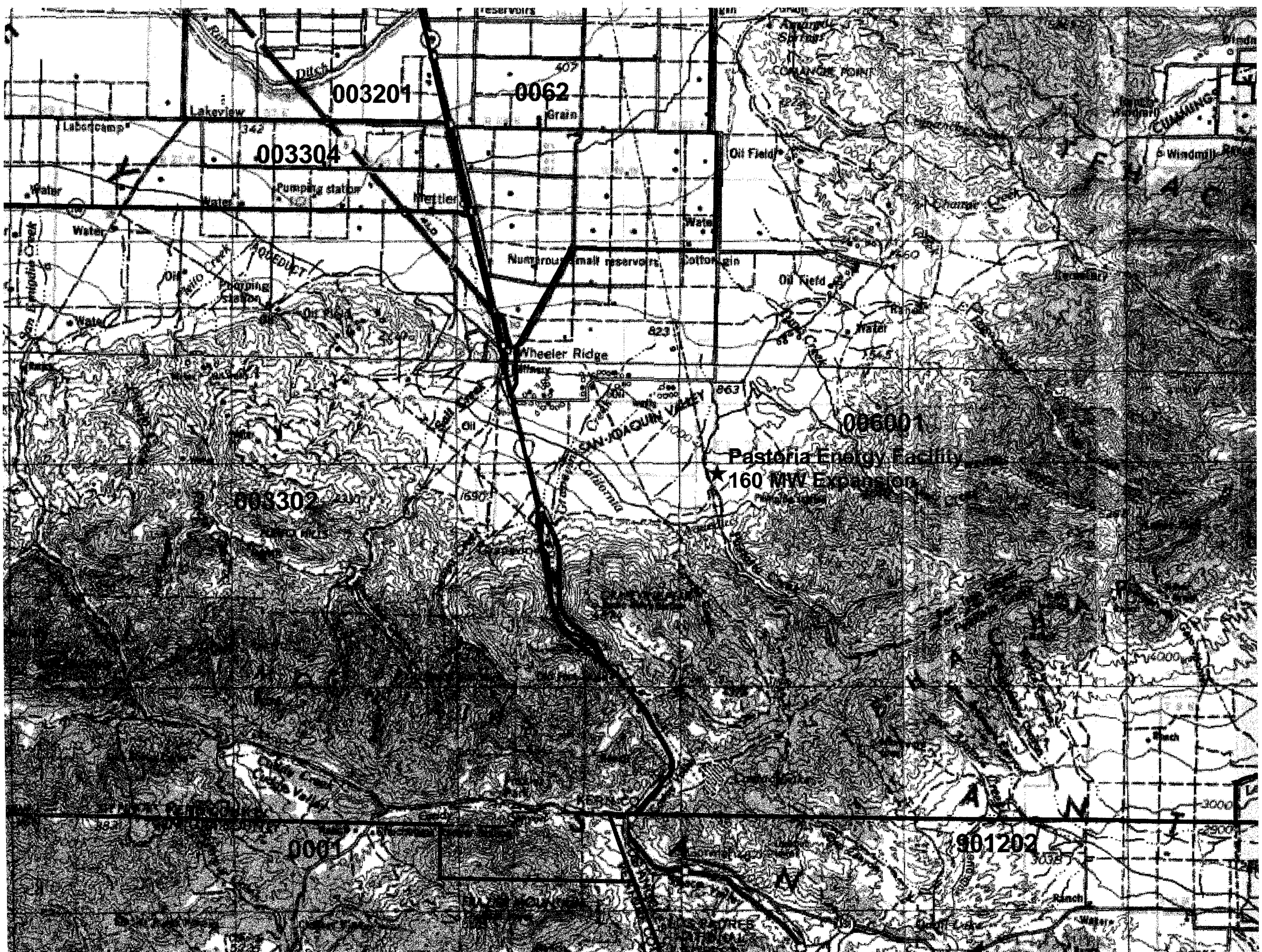
The construction phase of the PEF Expansion project is expected to take approximately 12 months. The construction plan and the expected deployment of construction equipment over this period are described in the Project Description (Section 3.8). Construction activities will be temporary and localized and, as noted previously, there are no sensitive receptors in the vicinity of the project site. Accordingly, no significant public health effects are expected during the construction phase of the PEF Expansion. Strict construction practices that incorporate safety and compliance with all applicable laws, ordinances, regulations, and standards (LORS) will be followed (see Section 7.0 of this application).

Temporary emissions of criteria pollutants from construction-related activities are discussed in Section 5.2. Modeling of ambient impacts of the project's PM_{10}, CO, and NO_x emission during construction was performed as part of the air quality analysis, as described in Section 5.2.5.6. Construction-related emissions are temporary and localized, resulting in no long-term impacts to the public. All predicted maximum concentrations occurred at locations along the immediate property boundary.

The State of California has designated particulate matter in diesel exhaust as a toxic air contaminant. Accordingly, the combustion portion of projected annual PM_{10} emissions due to construction of the PEF expansion (see Section 5.2.5.6 and Appendix D of the Air Quality Technical Report) was modeled separately to estimate the annual average diesel PM_{10}



Pastoria Energy Facility 160 MW Expansion	Map 5.16-1. TERRAIN ABOVE STACK HEIGHT (391 METERS) WITHIN A 10 MILE RADIUS OF THE EXISTING PEF SITE
Pastoria Energy Facility, LLC	



Area (sq miles)	Census Tract	Population Density (people per sq mile)
621.75	003304	4.94
1314.87	006001	13.87
169.77	003201	45.25
180.26	0062	21.58
429.30	003302	18.42
922.21	0001	0.94
371.72	901202	10.40

Pastoria Energy Facility
160 MW Expansion

Pastoria Energy Facility, LLC

Map 5.16-2. POPULATION CENSUS TRACTS AND POPULATION DENSITY exhaust concentration in the vicinity of the PEF site. This information was used with HARP-derived risk values for diesel exhaust particulates for a 70-year lifetime to estimate the potential carcinogenic risk from diesel exhaust during construction. The calculated 70-year exposure was adjusted by a factor of 12/840, or 0.0143, to correct for an assumed maximum 12-month exposure to construction emissions.

The maximum modeled annual average concentration of diesel exhaust PM_{10} at any location is 0.0.281 $\mu g/m^3$. The risk values obtained from the HARP model range from 2.86×10^{-4} (average point estimate value) to 4.15×10^{-4} (derived OEHHA and high end risk estimates). Using the range of risk values and adjustment factors described above, the carcinogenic risk resulting from exposure to diesel exhaust during project construction activities was estimated to be between approximately 1.2 and 1.7 in one million. This is well below the level of 10 in one million that is considered by the CEC staff as a criterion of significance.

The predicted maximum impacts from construction are highly localized near the project site. The isopleth diagram in Figure D-3 of Appendix D, Attachment D-1 of the Air Quality Technical Report shows that the area in which the cancer risk due to diesel particulate exposure may exceed 1 in one million (diesel PM_{10} concentration greater than or equal to 0.168 $\mu g/m^3$) barely extends beyond the facility fenceline. Furthermore, these results are conservative because, as discussed in the discussion of the construction air quality modeling analysis in Appendix D of the Air Quality Technical Report, modeled PM_{10} concentrations from construction operations are generally overpredicted by the ISCST3 model.

Small quantities of hazardous waste may be generated during the construction phase. Hazardous waste management plans will be in place so that the potential for public exposure will be minimal. Refer to Section 5.14 (Waste Management) for more information.

5.16.2.2 Public Health Risks – Operational Impacts

A screening level health risk assessment for the operational PEF Expansion project has been prepared using CARB's HARP computer program and associated guidance in the OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (August 2003). The HARP model was used to assess potential cancer risk impacts, as well as chronic and acute non-cancer risks due to the PEF Expansion alone and the expanded PEF as a whole.

The health risk assessment was conducted in three steps. First, a hazard identification step was performed to identify and quantify the PEF Expansion project sources of toxic air contaminants. Second, the potential human health risk for a unit level of exposure to individual toxic air contaminants was evaluated by application of the HARP risk assessment model. Finally, the expected actual emission rates of the individual toxic air contaminants were combined with the HARP unit risk values to develop weighted input values that were used in the ICSCT3 dispersion model to estimate actual cancer risk and hazard indices at receptor locations surrounding the PEF project site. The following subsections describe these analysis steps.

5.16.2.2.1 Hazard Identification. The hazard identification involved an evaluation of the toxic air contaminants (TACs) potentially generated by the PEF Expansion that may cause health effects when released to the air. The chemicals evaluated in this regard were identified from the lists of TACs included in the emission factors for natural gas-fired combustion turbine generators (CTGs) in the USEPA AP-42 Compilation of Air Pollutant Emission Factors and/or the California Air Resources Board's CATEF database. Maximum hourly and annual TAC emissions were estimated for the proposed expansion CTG using these emission factors (in units of pounds of pollutant per MMcf), the heat input rates for project equipment (in MMBtu/hr and MMBtu/yr) and the nominal higher heating value for natural gas of 1056 Btu/scf. Hourly and annual emissions were based on the heat input rates of 1,791 MMBtu/hour and 15,689,160 MMBtu/year, respectively. The ammonia emission factor was derived from the proposed ammonia slip limit of 10 ppmv @ 15% O_2.

Table 5.16-1 presents a list of TACs that may be emitted routinely from the Expansion CTG, along with their toxic effects and toxicological endpoints. Table 5.16-2 lists the computed maximum hourly and annual emissions estimates of these substances for the Expansion CTG.

Similar methods were used to develop air toxics emissions information from sources of the existing PEF for the analysis of cumulative project-related risks. Tables 5.16-3 and 5.16-4 present emissions estimates for the existing combustion turbines and the existing emergency generator and firewater pump.

Section 5.15, Hazardous Material Handling, provides more detailed information on chemicals stored and used on the PEF site and the potential impacts associated with their use and storage. A discussion of the possible consequences of a potential accidental release of hazardous materials is also included in Section 5.15.

5.16.2.2.2 Exposure Assessment Methods.

Significance Criteria

Cancer Risk. Cancer risk is the probability of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are assumed not to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed

TABLE 5.16-1
TOXIC AIR CONTAMINANTS POTENTIALLY EMITTED FROM NATURAL GAS FIRED TURBINES

Pollutant	Carcinogen	Chronic Non-Carcinogen	Acute Non-Carcinogen	Toxicological Endpoint (Chronic Toxicity)
Acetaldehyde	X	X		Respiratory system; human carcinogen
Acrolein		X	X	Respiratory system
Ammonia		X	X	Respiratory, skin irritation or other effects
Benzene	X	X	X	Central or peripheral nervous system; human carcinogen
1,3-Butadiene	X			Human carcinogen
Ethylbenzene[1]				--
Formaldehyde	X	X	X	Respiratory system; human carcinogen
Hexane[1]				--
Naphthalene		X		Cardiovascular or blood system
Propylene		X		Respiratory system
PAHs	X			Human carcinogen
Propylene Oxide	X	X	X	Central or peripheral nervous system, kidney, gastrointestinal system and liver, reproductive system including teratogenic and developmental effects, respiratory system, skin irritation or other effects; human carcinogen
Toluene		X		Central or peripheral nervous system and reproductive system including teratogenic and developmental effects
Xylene		X	X	Reproductive system including teratogenic and developmental effects and respiratory system

[1] Not an AB 2588 Toxics "Hot Spots" chemical.

TABLE 5.16-2
MAXIMUM PROPOSED TAC EMISSIONS:
EXPANSION COMBUSTION GAS TURBINE

Compound	Emission Factor (lb/mmcf)[a]	Maximum Proposed Emissions	
		lb/hr	tpy
Ammonia[b]	10 ppm	24.1	101.2
Propylene	0.771	1.3	5.7
Hazardous Air Pollutants			
Acetaldehyde	0.0408	$6.9x10^{-2}$	0.3
Acrolein	0.00654	$1.1x10^{-2}$	$4.9x10^{-2}$
Benzene	0.0123	$2.1x10^{-2}$	$9.1x10^{-2}$
1,3-Butadiene	0.000439	$7.4x10^{-4}$	$3.3x10^{-3}$
Ethylbenzene	0.0326	$5.5x10^{-2}$	0.24
Formaldehyde	0.0635	0.11	0.47
Hexane	0.259	0.44	1.9
Naphthalene	0.00133	$2.25x10^{-3}$	$9.9x10^{-3}$
PAHs[c]	0.00017	$3.0x10^{-4}$	$1.3x10^{-3}$
Propylene Oxide	0.0296	$4.6x10^{-2}$	0.20
Toluene	0.133	0.23	0.99
Xylene	0.0653	0.11	0.48
Total HAPs			**4.8**

[a] Obtained from AP-42 and the CATEF database for natural gas-fired combustion turbines.

[b] Based on an exhaust NH_3 limit of 10 ppmv @ 15% O_2.

[c] Carcinogenic PAHs only; naphthalene considered separately.

to have some probability of causing cancer, and the lower the exposure the lower the cancer risk (i.e., a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk of ten-in-one-million or more due to a project is considered to be a significant impact on public health. For example, the ten-in-one-million risk level is used by the Air Toxics “Hot Spots” (AB 2588) program and California’s Proposition 65 as the public notification level for air toxic emissions from existing sources. The SJVUAPCD allows for an incremental risk of ten-in-one-million in permitting new sources, provided toxics best available control technology (T-BACT) is employed, which for combustion sources is generally considered to be the use of natural gas fuel. For assessing the significance of potential risks from the existing PEF and PEF Expansion emissions, a significant impact criterion for lifetime incremental cancer risk of ten-in-one-million is appropriate. Toxicity data incorporated in the HARP model for specific carcinogens were used in all health risk calculations for this analysis.

TABLE 5.16-3
ANNUAL AND MAXIMUM HOURLY NON-CRITERIA POLLUTANT EMISSIONS FROM EXISTING CTGS

Pollutant	CTG Emission Factor(1) lb/MMscf	CTGs Max. Hourly Emissions lbs/hr (each)	CTGs Annual Emissions tpy (each)
Ammonia	(2)	24.06	105.40
Propylene	7.71E-01	1.34	5.87
Hazardous Air Pollutants			
Acetaldehyde	4.08E-02	7.09E-02	0.31
Acrolein	6.54E-03	1.14E-02	4.98E-02
Benzene	1.23E-02	2.14E-02	9.37E-02
1,3-Butadiene	4.39E-04	7.63E-04	3.34E-03
Ethylbenzene	3.26E-02	5.67E-02	0.25
Formaldehyde	6.35E-02	0.11	0.48
Hexane	2.59E-01	0.45	1.97
Naphthalene	1.33E-03	2.31E-03	1.01E-02
PAHs (listed individually below)	1.79E-04	3.11E-04	1.36E-03
Anthracene			
Benzo(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthrene			
Benzo(k)fluoranthrene			
Chrysene			
Dibenz(a,h)anthracene			
Indeno(1,2,3-cd)pyrene			
Propylene oxide	2.69E-02	4.68E-02	0.20
Toluene	1.33E-01	0.23	1.01
Xylene	6.53E-02	0.11	0.50
Total HAPs =			**4.89**

Notes:

(1) All factors except PAHs, hexane, formaldehyde and propylene from AP-42, Table 3.1-3, 4/00. Formaldehyde reflects 25 ppbvd MACT limit. Individual PAHs, hexane, and propylene are CATEF mean results, as AP-42 does not include factors for these compounds.

(2) Based on 10 ppm ammonia slip from SCR system.

(3) Based on maximum CTG firing rate of 1,837.0 MMBtu/hr and fuel HHV of 1,056.4 Btu/scf 1.74 MMscf/hr per CTG

(4) Based on maximum CTG firing rate (from [3]) for 8760 hrs/yr. 15,233 MMscf/year per CTG

TABLE 5.16-4
ANNUAL AND MAXIMUM HOURLY NON-CRITERIA POLLUTANT EMISSIONS FROM AUXILIARY EQUIPMENT

Emergency Generator			
Pollutant	**Emission Factor (lb/MMcf)**	**Maximum Hourly Emissions (lb/hr)**	**Maximum Annual Emissions (lb/yr)**
Acetaldehyde	5.29E-01	1.06E-04	0.00
Acrolein	5.90E-02	1.18E-05	0.00
Benzene	2.18E-01	4.36E-05	0.00
1,3-Butadiene	3.67E-01	7.34E-05	0.00
Formaldehyde	4.71E+00	9.42E-04	0.00
Naphthalene	2.51E-02	5.02E-06	0.00
PAHs	1.34E-04	2.69E-08	0.00E+00
Benz(a)anthracene	5.88E-05		
Benzo(b)fluoranthene	4.09E-05		
Benzo(k)fluoranthene	7.83E-06		
Benzo(a)pyrene	2.70E-06		
Chrysene	1.43E-05		
Dibenz(a,h)anthracene	2.70E-06		
Indeno(1,2,3-cd)pyrene	7.17E-06		
Toluene	2.39E-01	4.78E-05	0.00
Xylene	6.46E-01	1.29E-04	0.00
Diesel Fire Pump Engine			
Pollutant	**Emission Factor (g/bhp-hr)**	**Maximum Hourly Emissions (lb/hr)**	**Maximum Annual Emissions (lb/yr)**
Diesel exhaust particulate	7.00E-02	2.55E-03	0.51

Non-Cancer Risk. Non-cancer health effects can be either chronic or acute. In determining potential non-cancer health risks (chronic and acute) from a specific air toxic, it is assumed that there is a threshold dosage of the chemical below which there would be no impact on human health. The air concentration corresponding to this dose is called the reference exposure level (REL). For non-inhalation environmental pathways, the threshold dose is typically expressed in terms of the reference dose (RfD), which is an allowable daily dose per body weight (mg/kg-day). Non-cancer health risk is measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for those pollutants that affect the same target organ are typically summed, and the resulting totals are expressed as health hazard indices (HHIs) for each organ system. A HHI of less than 1.0 is considered to be an insignificant health risk. RELs used in the hazard index calculations were those incorporated for specific compounds by the HARP model.

Chronic toxicity is defined as an adverse health effect from prolonged chemical exposure, caused by chemicals accumulating in the body. Since chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure levels for a non-carcinogenic air toxic is the chronic REL or RfD. Below these thresholds, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic health hazard index is calculated as the sum of the hazard quotients (based on annual average concentrations) for all pollutants that target a given organ.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than levels required to produce chronic effects. Acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures. One-hour average concentrations are divided by acute RELs to obtain a health hazard index for health effects caused by relatively high, short-term exposure to air toxics.

Risk Calculations. The screening health risk assessment was conducted to estimate the offsite cancer risk to the maximally exposed individual (MEI) and to maximally exposed workers, and to identify any adverse effects of non-carcinogenic compound emissions. The CARB/OEHHA HARP computer program was used to evaluate multipathway exposure to toxic substances. Because of the conservatism (overprediction) built into the established risk analysis methodology, the actual risks will be lower than those estimated. Both the incremental risks due to the new turbine and the total risks from the modified facility were evaluated.

The risk assessment module of the HARP model was run using unit ground level impacts to obtain derived cancer risks for each toxic chemical of interest.[1] Cancer risks were obtained for the derived (OEHHA) method, the derived (adjusted) method, average point estimate and high-end point estimate options. The HARP model output was in the form of cancer risk by pollutant and route for each type of analysis, based on an exposure of 1.0 g/m^3. The emission rates of the toxic air contaminants were then combined with the unit values produced by the HARP model to determine weighted input values that were subsequently used in the ICSCT3 dispersion model to estimate actual cancer risk and health hazard indices. Appendix C, Attachment C-1 of the Air Quality Technical Report presents HARP model output showing the calculated unit risk values for each pollutant. Individual cancer risks are expressed in units of risk per μg/m^3 of exposure. To calculate the weighted risk for each source, the annual average emission rate in g/s for each pollutant was multiplied by the individual cancer risk

[1] The procedure for estimating unit risks based on an assumed unit exposure level is described in Part B of Topic 8 of the HARP How-To Guides: How to Perform Health Analyses Using a Ground Level Concentration.

for that pollutant in $(\mu g/m^3)^{-1}$. The resulting weighted cancer risks for each pollutant were then summed for the source. The same procedure was used to estimate the acute and chronic health impacts associated with the proposed project. Details of the calculations of risk "rates" for modeling are shown in the tables of Appendix C, Attachment C-2 of the Air Quality Technical Report.

The total weighted risk "rate" for each source was used in place of emission rates with ISCST3 model unit impact results to obtain estimates of the cancer risk and the acute and chronic health hazard indices. The modeled value is total cancer risk or HHI, as appropriate, at each receptor. The modeling analysis for the health risk assessment was performed using the ISCST3 model and 1963 Bakersfield meteorological data.

Risks Due to PEF Expansion Alone. For the assessment of the health risk from emissions of the Expansion CTG alone, the ISCST3 model was run with the weighted "risk" rates in place of emission rates along with the stack parameters for the PEF Expansion turbine operating case that produced the highest annual average full-load impacts in the air quality screening analysis of Section 5.2.5.4.1. The acute and chronic health hazard indices were modeled in the same manner.

The contribution of each toxic compound to total cancer risk and total HHI for each analysis method was then determined using the individual contribution of each compound to the total weighted risk "rate." This allocation is shown in the tables in Appendix C, Attachment C-2 of the Air Quality Technical Report.

Total Risk From Facility After Expansion. The stack parameters and emission rates used to model combined impacts from the new turbine and the existing PEF are shown in the Air Quality Technical Report, Appendix B, Table B-4, and summarized in Table 5.16-5.

5.16.2.2.3 Results of Air Toxics Health Risk Calculations. The results of the screening level health risk assessment are summarized in Table 5.15-6. This table shows that the maximum predicted cancer risk from the operational project is well below the significance level of 10 in one million. In addition, the acute and chronic health impacts (hazard indices) are well below the significance level of one. Consequently, there are no significant toxic air contaminant impacts issues associated with the proposed project. The locations of the three maximum cancer, acute, and chronic risks from the expansion turbine are shown in Figure 5.16-1.

FIGURE 5.16-1
LOCATIONS OF TOP THREE ACUTE, CHRONIC AND CANCER RISKS FROM EXPANSION CTG

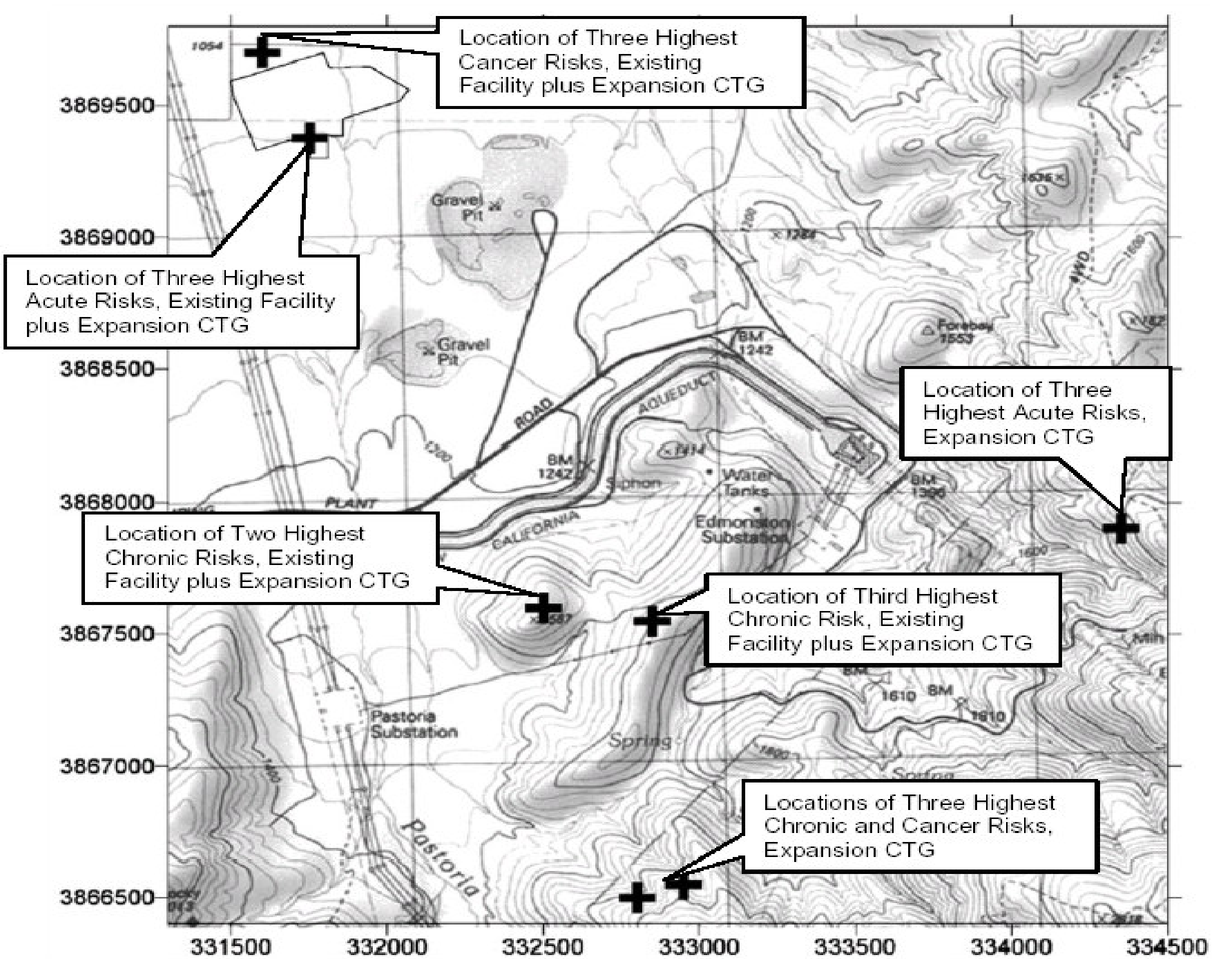


TABLE 5.16-5
STACK PARAMETERS FOR CUMULATIVE HRA

Unit	Stack Diameter (m)	Stack Height (m)	Exhaust Temp (Deg K)	Exhaust Velocity (m/s)
Expansion CTG	6.934	39.929	716.333	36.662
Existing CTG1 (1)	5.490	45.720	364.260	20.940
Existing CTG2 (1)	5.490	45.720	364.260	20.940
Existing CTG3 (1)	5.490	45.720	364.260	20.940
Existing Emergency Generator (1)	0.305	7.620	660.930	27.390
Existing Diesel Fire Pump Engine (2)	0.152	6.096	727.594	50.921

Notes:
(1) Refer to the Air Quality Technical Report, Appendix B, Table B-4.
(2) Source: SJVUAPCD September 2004 Risk Management Review Report

TABLE 5.16-6
SCREENING LEVEL RISK ASSESSMENT RESULTS

Risk Methodology	Incremental Risk from Expansion Project	Risk from Existing Facility	Total Facility Risk After Modification
Modeled Cancer Risk for 70-Year Exposure (in one million)			
MEI: Derived (OEHHA) Method	0.08	2.2	2.2
MEI: Average Point Estimate	0.03	1.5	1.5
MEI: High-end Point Estimate	0.08	2.2	2.2
MEI: Derived (adjusted) Method	0.08	1.7	1.7
Nearest Residence: High-end Point Estimate	<0.0001	0.005	0.005
Modeled Worker Cancer Risk (in one million)			
Worker Exposure: Derived (OEHHA) Method	0.02	0.34	0.34
Modeled Acute and Chronic Impacts			
Acute HHI	0.03	0.35	0.35
Chronic HHI	0.004	0.03	0.03

Notes:
Cancer risk significance level is 10 in one million.
Acute and Chronic HHI significance levels are each 1.0.

The more detailed modeling results in Appendix C, Attachment C-2 of the Air Quality Technical Report show that the majority of the cancer risk from the existing facility is due to the existing diesel fire pump engine. The range of cancer risks shown is for the location of the maximum modeled concentration, which is very close to the plant site, as shown in

Figure 5.16-1. The cancer risk at the nearest residence is much lower, as the nearest residence is over 8 km from the plant site. The SJVAPCD staff prepared a screening health risk assessment for the diesel fire pump engine when the unit was permitted in 2004 and found that the maximum residential risk was 0.6 in one million. The SJVAPCD staff risk assessment is included as Attachment C-3 to Appendix C of the Air Quality Technical Report.

5.16.2.2.4 Uncertainties in the Analysis. Predictions of future health risks related to the proposed project reflect uncertainties because of knowledge gaps in the science of health risk assessment, as well as the need to simplify some aspects of the process for a manageable computational effort. There are uncertainties associated all aspects of such assessments, including the assumed emissions, dispersion modeling techniques and toxicological factors, as well as uncertainties with respect to the characteristics of the potentially exposed population. For example, possible exposure scenarios could include an assumption that a person resides in one location for the average period of U.S. residency (about nine years), or for the 90th percentile of residency (about 30 years) or for an entire lifetime (about 70 years); and/or use estimated exposure magnitudes ranging from an average value to the highest modeled concentration at a particular receptor to the highest concentration at any receptor.

Because risk assessments are often performed to determine an appropriate exposure limit that will be protective of public health, the assumptions used in health risk estimates for regulatory purposes, are purposely selected to ensure that risk will more likely be overestimated rather than underestimated. This is true of the methodology described above, which adheres to CARB and OEHHA guidance designed to provide conservative health risk estimates. The following discussion describes the uncertainties and variabilities in the major components of an air toxics health risk assessment.

Emissions. The emission factors from the CATEF database for gas turbines and other PEF sources may contain errors due to the limited source test data used in their development. However, for both the one-hour and annual averaging periods, it was assumed that all gas turbines operate continuously at maximum load conditions. Actual hours of operation and typical fuel heat input rates will be generally lower.

Air Dispersion Modeling. EPA-approved dispersion models, such as ISCST3, tend to over-predict, rather than under-predict, concentrations of air toxics. For example, all chemical emissions are assumed to remain chemically unchanged following their release to the atmosphere. For certain pollutants, conversions may occur rapidly enough to reduce concentrations over the source-receptor distance to levels below the conservative model predictions. Moreover, these models use assumptions regarding plume dispersion that tend to over-predict concentrations for most applications, which is consistent with their use for regulatory permitting and compliance demonstration purposes.

Exposure Assessment. The most important uncertainties related to exposure are related to the definitions and characteristics of exposed populations. The choice of a maximally exposed individual (MEI) is very conservative, in the sense that no real person is likely to spend 24 hours a day, 365 days a year over a 70-year period at exactly the point of highest toxicity-weighted annual average air concentration. The greatest true exposure of any individual is likely to be at least ten times lower than that calculated using the MEI assumption.

Toxicity Assessment. The toxicity values for specific chemicals incorporated by the different risk calculation algorithms of the HARP model have been specifically selected to provide conservative health risk estimates. These toxicity estimates are derived either from observations in humans or from projections derived from experiments with laboratory animals. Human data are obviously more relevant for health risk assessments, but are often uncertain because of the difficulty in isolating the effects of one specific pollutant, insufficient numbers of people studied, relatively high occupational exposures (the source of most human data) which must be extrapolated to low environmental exposures, or because of the subset of the population studied being more or less susceptible than the population as a whole. Cancer risk coefficients from human data are typically considered to be best estimates and are applied without safety factors. Cancer risk is typically considered proportional to pollutant concentration at any level of exposure (i.e., a linear, no-threshold model), which is conservative at low environmental doses. For non-cancer health effects, the lowest exposure known to cause adverse effects in humans is usually adjusted using uncertainty or safety factors to account for variations in susceptibility and other factors.

When toxicity estimates are derived from laboratory animal data, they usually involve extra safety factors to account for the possibility of greater sensitivity in humans, and to adjust for lower typical lifetimes than those for humans. Overall, the toxicity assumptions and criteria used in the proposed project's risk assessment are biased toward overestimating risk. The amount of the bias is unknown, but could be substantial.

5.16.2.3 Criteria Pollutants

Four criteria pollutants were modeled and evaluated for their impacts on air quality and human health (see Section 5.2). Modeling results for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) indicate that health impacts of criteria pollutants are not significant. Maximum predicted concentrations of the criteria pollutants were compared with

National and California Ambient Air Quality Standards (NAAQS/CAAQS), which are health-based levels that serve as inhalation reference doses. With the exception of PM_{10} (which already exceeds the CAAQS without the proposed project), the NAAQS/CAAQS are not exceeded. Therefore, significant adverse health effects are not anticipated.

5.16.2.4 Public Health Risks – Chemicals Stored and Used on Site

The SCR air pollution control system will involve the storage of anhydrous ammonia in amounts exceeding the threshold planning quantity (TPQ) for the California Accidental Release Prevention Program (CalARP). The ammonia would be the only chemical considered by the State to be an acutely hazardous material that will be stored and used on site in amounts exceeding a TPQ, and potentially triggers Risk Management Plan (RMP) requirements under the CalARP regulations. Accidental releases of ammonia have the potential to adversely affect public health. Refer to Section 5.15 (Hazardous Materials Handling) for more information and an assessment of potential offsite consequences from hypothetical releases of ammonia. The offsite consequence analysis documented in Section 5.15 indicates that no significant offsite hazards would occur from an accidental release of anhydrous ammonia at the PEF.

The Applicant will coordinate with local emergency response units by: 1) providing them with copies of the plant site Emergency Response Plan; 2) conducting plant site tours to point out the location of hazardous materials and safety equipment; and 3) encouraging participation in annual emergency response drills.

5.16.2.5 Summary of Air Toxics Public Health Risk Impacts

Results from an air toxics risk assessment based on emissions modeling indicate that there would be no significant incremental public health risks (including risks to the more sensitive members of the population) due to air toxics emissions associated with either the construction or operation of the PEF Expansion. Also, as discussed in Section 5.2, results of dispersion modeling for routine project operations indicate that predicted ambient concentrations of NO_2, CO, SO_2, and PM_{10} meet the federal requirements that have been established to protect the public health.

5.16.3 Electromagnetic Field Exposure Evaluation

Section 4.2 discusses transmission line safety and nuisance, focusing on aviation safety, audible noise and radio/television interference, electric shock, and potential effects on cardiac pacemakers. Electric and magnetic field strengths associated with the proposed transmission lines are presented in Section 4.2.4. The following discussion addresses the potential effects of electric and magnetic fields on human health.

Exposure to both electric and magnetic fields (EMFs) occurs whenever electric current flows. Concern about health effects from EMFs arose in 1979 when researchers calculated a weak statistical link between proximity to power lines and childhood leukemia. This study was based on wire-code classifications for residences and the incidence of leukemia. Since then, many other researchers have investigated this potential association and other types of potential human health effects from EMFs. In 1991, Congress asked the National Academy of Sciences (NAS) to review the research literature on the effects of EMF exposure and determine whether sufficient scientific basis existed to assess health risks from such exposure. In response, the National Research Council (NRC) convened the Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. After examining more than 500 studies spanning 17 years of research, the committee concluded in an October 1996 report that there is no conclusive evidence that EMFs play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems (NRC 1996).

On June 27, 1998, a 28-member advisory panel sponsored by the National Institute of Environmental Health Science (NIEHS), part of the National Institute of Health, voted 19 to nine to label EMFs a "possible human carcinogen," which kept open funding for continuing government studies. On May 4, 1999, NIEHS issued a report entitled *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields* (NIEHS 1999). This report found that the evidence is "weak" that electric and magnetic fields cause cancer. The report concludes: "The NIEHS believes that the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm." While the report says EMF exposure "cannot be recognized as entirely safe," the report goes on to say "… the conclusion of the report is insufficient to warrant aggressive regulatory action." Because virtually everyone in the United States is exposed to EMF, the report recommends that "… passive regulatory action is warranted such as continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures," but that cancer and non-cancer health outcomes do not provide "… sufficient evidence of a risk to warrant current concern."

The PEF Expansion requires no modifications to the existing PEF electric transmission lines. The PEF Expansion shares common transmission facilities with the existing PEF. The existing PEF switchyard will accommodate the PEF Expansion with the addition of a 230 kV circuit breaker in one of the switchyard spare bays. The transmission lines connecting the plant to SCE's system are already sized to carry the output of the PEF Expansion. A complete description of the shared transmission facilities is included in Attachment A, Project Description Materials, appended to this application.

The electric field strengths for the existing PEF transmission lines present no risk of primary electric shock (those that can result in direct physiological harm), as discussed in Section 4.2.4 of 99-AFC-7. Secondary shocks (those that could cause an involuntary movement but no direct physiological harm) are possible, however such occurrences are anticipated to be very infrequent and will most likely be barely perceptible. Given this assessment, and the lack of sufficient evidence of health hazards to exposed humans, there is no anticipated impact on public health. The magnetic fields are potentially of greater concern because, unlike the companion electric field, a magnetic field can penetrate most objects, causing individuals located indoors to be exposed. The estimated magnetic fields associated with the existing PEF transmission lines are similar in intensity to those from transmission lines currently in service of the same voltage class and current-carrying capacity. Although the public health significance of project-related exposures cannot be characterized with certainty, the current evidence in the scientific literature suggests that any such risks would be small. Given the distance of the existing PEF transmission lines to residences and the rapid decrease of field strength with distance (field strengths drop with the square of distance from power lines), any long-term exposures at residences are estimated to be within normal background levels, which are approximately one mG or less.

5.16.4 Mitigation Measures

The proposed project has been designed to minimize potential public health risks, including use of natural gas as fuel and incorporation of appropriate emission control measures. Based on the results of the air toxics and EMF risk assessments described in the preceding subsections, no additional mitigation measures are required to reduce risks, since all risk estimates are well within acceptable levels.

5.16.5 Significant Unavoidable Adverse Impact

No significant unavoidable adverse impacts on public health are anticipated from the PEF Expansion.

5.16.6 LORS Compliance

The PEF Expansion will comply with all applicable laws, ordinances, standards, and regulations (LORS) that are applicable or potentially applicable to the existing PEF and PEF Expansion projects in the context of public health. The LORS are outlined in Section 7.0 of this application.

5.16.7 References

California Air Resources Board. 1996. California Air Toxic Emission Factor (CATEF) database. Version 1.2. April 11, 1996.

California Office of Environmental Health Hazard Assessment. 2003. *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (August 2003).

National Cancer Institute. 2000. Surveillance, Epidemiology, and End Results (SEER) Cancer Statistics Review, 1973-1997. Bethesda, MD.

National Institute of Environmental Health Sciences. 1999.Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. National Institute of Health. May 4,1999.

National Research Council. 1996. Possible Effects of Exposure to Residential Electric and Magnetic Fields. Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. National Academy of Sciences. October 1996.

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